

5.16.24 DETERMINATION OF FREE MOISTURE OR ABSORPTION OF AGGREGATE
FOR USE IN CONCRETE (Kansas Test Method KT-24)

a. SCOPE

This method of test covers the procedure for determining the free moisture or absorption of aggregates for use in concrete. Other methods may be used by permission from the District Materials Engineer.

b. REFERENCED DOCUMENTS

b.1. KT-6; Specific Gravity and Absorption of Aggregate

c. APPARATUS

c.1. Scale or balance having a minimum capacity of 2000 g readable to within 1 g, sensitive to within 0.5 g, and equipped with a device that may be used to determine the mass of aggregate suspended in water.

c.2. Bucket approximately 200 mm (8 in) in diameter and 200 mm (8 in) height, with suitable suspension device for determining the mass of aggregate when immersed and weighed in water.

c.3. Container with overflow in which the bucket may be immersed and weighed in water.

c.4. Drying pans.

d. SAMPLE

d.1. Secure a representative sample of the aggregate to be tested from a location as close to the point of use as possible.

d.2. Reduce by splitting to a weight of approximately 10000 g for coarse or mixed aggregate, or 5000 g for fine aggregate.

d.3. Stir sample thoroughly and divide into two approximately equal portions, "A" and "B".

d.4. Place each portion in a container and cover to prevent loss of moisture.

e. TEST PROCEDURE

e.1. If not available from previous tests, determine the bulk specific gravity (saturated, surface dry basis) of the aggregate in accordance with KT-6.

e.2. If free moisture is present on the surface of the aggregate, proceed as follows:

e.2.a. Bring portion "A" to a saturated, surface dry condition. For CA and MA aggregates, split sample into two portions on the 4.75 mm (No. 4) sieve, bring each portion to a saturated, surface dry condition as described in KT-6. For FA aggregates it will not be necessary to divide the sample.

e.2.b. Recombine the materials and weigh out a 2000 g for coarse aggregate (1000 g for MA-1 or FA-A) sample of the saturated, surface dry aggregate.

e.2.c. Pour slowly into the bucket which is about half filled with water and stir aggregate thoroughly to remove entrapped air.

e.2.d. Fill bucket with water and let material settle before carefully immersing the bucket and contents in the water in the large container.

e.2.e. Determine and record the mass of the saturated surface dry material in water (W_1).

NOTE: Unless aggregate sources change, the value for the mass in water of a 1000 or 2000 g sample of saturated, surface dried aggregate may be used for all moisture determinations made during the progress of the work.

e.2.f. Weigh out a 2000 g of coarse aggregate (1000 g for MA-1 or FA-A) sample from portion "B" and follow steps **e.2.c.** through **e.2.e.** Record this weight as W_2 .

e.3. If free moisture is not present on the surface of the aggregate, proceed as follows:

e.3.a. Cover portion "A" with water and let stand for not less than 20 or more than 21 minutes.

e.3.b. Remove the sample from the water and bring to a saturated, surface dry condition as in **e.2.a.**

e.3.c. Recombine the materials and weigh out a 1000 or 2000 g test sample of the saturated, surface dry material.

e.3.d. Proceed as directed in e.2.d., e.2.e. and e.2.f. above. |

e.3.e. Weigh out a 1000 or 2000 g sample from portion "B".

e.3.f. Pour the sample slowly into the bucket which is about half filled with water and stir the aggregate thoroughly to remove entrapped air.

e.3.g. Fill bucket with water and let material settle before carefully immersing the bucket and contents in the water in the large container.

e.3.h. Wait 20 to 21 minutes after immersing the sample in the bucket.

e.3.i. Determine the mass of the sample in water (W_2).

f. CALCULATIONS Percent moisture (or absorption).

$$X = (W_1 - W_2) \left[\frac{G_s}{(G_s - 1)} \right] \left[\frac{100}{S} \right]$$

Where: W_1 = Mass of 1000 or 2000 g saturated, surface dry sample (portion "A") immersed in water.

W_2 = Mass of 1000 or 2000 g test sample (portion "B") immersed in water.

G_s = Bulk Specific Gravity (Saturated, Surface Dry) of the aggregate being tested.

s = Mass of sample (in g) in air.

NOTE: A positive (+) answer indicates the percent of free moisture on the aggregate. A negative (-) answer indicates the amount of moisture the aggregate absorbed during the 20 minutes that it was immersed during the test.

Example:

G_s - Bulk Specific Gravity (Saturated,
 Surface Dry Basis)..... = 2.65
 S - Wt. of portion "A" in air..... = 2000 g
 W_1 - Wt. of portion "A" in water..... = 1246 g
 W_2 - Wt. of 2000 g portion "B"
 (test sample) in water..... = 1220 g

$$X = (1\ 246 - 1\ 220) \left[\frac{2.65}{2.65 - 1} \right] \left[\frac{100}{2000} \right] = 2.1\% \text{ free moisture in the aggregate}$$

NOTE: If W_2 had been larger than W_1 , the result would have been negative and the aggregate would have had a 20 minute moisture absorption potential.

g. TABLE FOR DETERMINATION OF MOISTURE CONDITION OF AGGREGATE

The following table may be used in lieu of the formula to determine the moisture condition of aggregates. The table has been set up on the basis of a 1000 g or 2000 g sample of an aggregate with specific gravity of 2.62. It is correct to within 0.1 percent for aggregate of specific gravity within the range of 2.50 to 2.70.

It is advisable to use the formula at first and occasionally thereafter in order to become familiar with the method. The formula must always be used when the specific gravity of the material in question is at the extreme limits, or outside of the range quoted above.

Table 5.16.6
 Determination of the Moisture Content
 of Concrete Aggregates by Displacement
 Method

% of Absorption or Moisture					
W1-W2	S = 1000 g	S = 2000 g	W1-W2	S = 1000 g	S = 2000 g
0	0.0	0.0	21	3.4	1.7
1	0.2	0.1	22	3.5	1.8
2	0.3	0.2	23	3.7	1.8
3	0.5	0.2	24	3.9	2.0
4	0.6	0.3	25	4.0	2.0
5	0.8	0.4	26	4.2	2.1

6	1.0	0.5	27	4.3	2.2
7	1.1	0.6	28	4.5	2.2
8	1.3	0.6	29	4.7	2.4
9	1.4	0.7	30	4.8	2.4
10	1.6	0.8	31	5.0	2.5
11	1.8	0.9	32	5.1	2.6
12	1.9	1.0	33	5.3	2.6
13	2.1	1.0	34	5.5	2.8
14	2.2	1.1	35	5.6	2.8
15	2.4	1.2	36	5.8	2.9
16	2.6	1.3	37	5.9	3.0
17	2.7	1.4	38	6.1	3.0
18	2.9	1.4	39	6.3	3.2
19	3.1	1.6	40	6.4	3.2
20	3.2	1.6			

W_1 = Mass of 1000 or 2000 g saturated, surface dry sample immersed in water.

W_2 = Mass of 1000 or 2000 g test sample immersed in water.

If W_2 is larger than W_1 the result would be negative and the aggregate would have a 20 minute moisture absorption potential.